

## **EXHIBIT #15: INDUCED DAMAGES MFR**

CENWK-EC-HH

27 Apr 2006

### **MEMORANDUM FOR RECORD**

**SUBJECT:** Kansas Citys Feasibility Study  
Argentine Levee Raise Induced Damages

1. Background. As a result of the Flood of 1993 the performance characteristics of the Kansas Citys Units were questioned. A feasibility study was begun to identify any deficiencies in the Kansas Citys system and determine if it is economically feasible to improve these levees. The Missouri River levees were found to provide adequate protection for the 0.2% chance event, but it was discovered that the performance of the Kansas River Units was lower than expected. A levee raise of the Argentine Unit has been identified as a proposed alternative in this feasibility study.

2. Problem. The feasibility study is examining the alternatives of raising the Argentine Unit (RM 4.28 to RM 9.82) along the Kansas River. Three alternatives are being examined: a raise to the nominal 0.2% chance flood event (500+0 alternative), a raise to the nominal 0.2% chance flood event plus 3.0-feet (500+3 alternative), and a raise to the nominal 0.2% chance flood event plus 5.0-feet (500+5 alternative). The feasibility study requires the analysis of any induced damages due to raises in the water surface profile caused by raises of the studied levee unit. The existing conditions HEC-RAS model of the Kansas River assumes a confined flow model with any flow behind the levee being considered ineffective. Since the interior protected area is considered ineffective in the event of overtopping, the HEC-RAS model does not reflect any change in water surface profiles due to a proposed levee raise. To identify any possible impacts upstream and opposite of the Argentine unit, limited conveyance in the protected area due to overtopping was investigated for this analysis. HEC-RAS is a steady state flow model, calculating the water surface profiles in a subcritical channel, such as the Kansas River, using backwater methodology from downstream to upstream. Therefore, HEC-RAS did not identify any impacts to the downstream levee units (Armourdale and Central Industrial District). The only method for the Argentine raise to impact downstream units is if additional flow is forced downstream due to the raise. This can only occur if the failure of the Argentine Unit in the existing conditions is temporarily reducing downstream flows as the flow through the levee breach fills the protected area and this breach flow is removed as the levee is raised.

3. Purpose of this MFR. The purpose of this MFR is to document the procedures used to estimate the induced damages upstream, opposite, and downstream of a proposed Argentine raise.

4. Outline of Study Process. A calibrated HEC-RAS model was developed for the existing conditions along the studied reach of the Kansas River as part of the Kansas Citys Feasibility Study. This existing conditions model has been peer reviewed and

through ITR. The existing conditions HEC-RAS model will be used as the basis for this analysis. This memorandum outlines the procedure used to estimate the induced damages due to the Argentine Levee raise. The procedure consisted of the following steps:

#### 4.1 Areas downstream of the Argentine Unit

- a) The flow that initiates overtopping was analyzed for the existing condition and each of the three studied alternative raises. The critical overtopping point was identified along the existing Argentine Unit at approximately levee station 240+00. This point begins overtopping at a flow of 317,000cfs. By definition the 500+0 alternative begins overtopping at the 0.2% chance event (341,000 cfs). The 500+3 and 500+5 levee raises were plotted versus the water surface profiles for the studied events. The 500+3 overtops in an event just greater than the 0.133% (750-yr event) chance event and the 500+5 alternative overtops in an event just greater than the 0.10% chance event (1000-yr event) (See Plate 1). The overtopping flow was found by interpolating between the flows associated with each frequency event bracketing the top of levee for both the 500+3 and 500+5 alternatives. The overtopping flows were found to be 372,000 cfs and 391,000 cfs for the 500+3 and 500+5 alternatives, respectively.
- b) The assumption was made that overtopping initiates a levee breach which will flow at a uniform flow rate until the protected area is filled from the breach flow. The interior area will fill to an elevation equal to the lowest top of levee elevation at the downstream end of the unit (elevation 770.37) when flow would begin re-entering the Kansas River over the top of the levee. A 5-foot interval aerial contour map, supplied by the Unified Government of Wyandotte County and Kansas City, Kansas, was used for the calculation of interior volume. The following table lists the results of the analysis of the volume interior to the Argentine Levee Unit.

Table 1. Argentine Levee Interior Volume

Elevation (ft above msl)	Contour Area (acre)	Volume Below Contour (ac-ft)
752	26.6	0
755	238.7	398
760	664.5	2,258
765	1493.3	5,394
770	1916.9	9,156
Total Volume =		<b>17,206</b>

- c) To calculate the possible flow reduction due to breach flow filling the Argentine protected area a flood hydrograph needed to be developed for the Kansas River. Gage records were used for developing the peak flows associated with the various frequency events in this feasibility study and the Upper Mississippi River System Flow Frequency Study (UMRSFFS) completed by the Kansas City District in

2001. There are no hydrographs associated with these peak flows as the modeling of the Kansas River has been steady state. The synthetic hydrograph for this analysis was based on a combination of the flood hydrograph taken from daily flow records taken at the Desoto gage during the 1951 flood event along the Kansas River and hourly flow records from the 1993 flood event taken at the Hannibal Bridge on the Missouri River. The 1951 flood event along the Kansas River had a peak flow of 486,000 cfs which is greater than the 0.067% chance event used in this study of 417,000 cfs. This flow was prior to reservoir regulation of the Kansas River basin which has greatly reduced the peak flows seen in the Kansas River and the shape of the flood hydrograph. Therefore, this hydrograph was not seen as typical of any future floods along the Kansas River. The largest discharge in the Kansas River since the 1951 flood is the 1993 flood with a peak discharge of 170,000 cfs. This discharge is between a 5% (150,000 cfs) and 2% (202,000 cfs) chance event along the Kansas River as calculated in the UMRSFFS. Since this study is analyzing floods greater than the 0.2% chance event, it was deemed that extrapolating a hydrograph from this frequent of an event to a low frequency event (0.2% chance) would distort the likely shape of the low frequency event hydrograph. Therefore, the hydrograph from the Hannibal Bridge along the Missouri River was seen as representative of a flood of this magnitude as the peak 1993 flow was 541,000 cfs (just greater than the 0.2% chance event along the Missouri River downstream of the Kansas River of 530,000 cfs). Since the Missouri River basin is also subject to reservoir control it was assumed that the hydrograph from the 1993 flood event along the Missouri River could be representative of a 500-yr hydrograph along the Kansas River. The 1951 Kansas River and 1993 Missouri River hydrographs were scaled to match the 0.2% chance flood peak of 341,000 cfs on the Kansas River. The peaks of these scaled hydrographs were then overlain with the rising limb and falling limb of the synthetic hydrograph being the average of the 1951 Kansas River hydrograph and 1993 Missouri River hydrograph at a given time before or after the peak (See Plate 2). This synthetic hydrograph shape was then scaled to match the peak flow of each frequency event to develop a hydrograph for each studied event.

- d) It was assumed that a breach of constant flow would occur at the time of overtopping. The point on the rising limb of the 500-yr hydrograph when 317,000 cfs was encountered initiated a breach. This breach was assumed to introduce a constant flow of 10,000 cfs into the protected area. At the assumed rate of 10,000 cfs of inflow, the interior volume of 17,206 ac-ft would fill in approximately 21 hours before the downstream end of the Argentine Unit would begin allowing flow to re-enter the Kansas River. During this period of filling, the peak flow in the Kansas River would be reduced by the flow entering the levee breach (See Plate 3). If the breach occurred on the rising limb at a time close enough to the peak of the hydrograph, the peak would be reduced due to the loss of flow into the Argentine interior. This process was done for each event where overtopping would occur (0.2%, 0.133%, 0.1%, 0.08%, and 0.067% chance events). The peak flow in the Kansas River was recorded. Due to uncertainty of

the breach flow, a series of flows were analyzed assuming breach flows of 5,000 cfs, 10,000 cfs, 20,000 cfs, and 30,000 cfs. At a breach flow of 30,000 cfs, the interior of the Argentine Levee was filled prior to the peak of the 500-yr hydrograph, thus any greater breach flow would also fill prior to the peak of the hydrograph, having no impact on peak flows seen in the Kansas River.

- e) This process was repeated for each levee raise alternative to determine the impact of breach flows on peak flows seen in the Kansas River. The different levee raises consisted of breaches occurring at different flows along the rising limb of the hydrograph based on the overtopping flow associated with each alternative. A matrix seen in Table 2 was created to identify the minimum flow for each frequency of flood event for each proposed alternative. It is evident that for the 0.2% chance (500-yr) in the existing condition a levee breach can reduce the peak flow in the Kansas River to 335,625 cfs. Each proposed alternative (500+0, 500+3, and 500+5) should not allow overtopping in the 0.2% chance (500-yr) event and therefore allow the full 341,000 cfs to pass downstream. This allows a potential increase of 5,375 cfs of the peak flow seen at the Armourdale and CID Kansas Units in the 0.2% chance (500-yr) event caused by the proposed raises. It is possible to show that peak flows can be reduced by the proposed alternatives in some instances, but these cases have been neglected. The heavy “stair-stepped” line in Table 2 shows the limits of induced damages possible by the proposed raises.

Table 2. Matrix of Possible Flows With Argentine Breach

Alternative	Breach Flow	Peak Flows Seen D/S of Argentine (cfs)				
		500-yr	750-yr	1000-yr	1250-yr	1500-yr
EC Flow	---	341,000	367,000	388,000	403,000	417,000
No Raise	5k Breach	336,000	<b>362,000</b>	<b>383,000</b>	398,000	412,000
	10k Breach	<b>335,625</b>	367,000	388,000	403,000	417,000
	20k Breach	341,000	367,000	388,000	403,000	417,000
	30k Breach	341,000	367,000	388,000	403,000	417,000
500-yr Raise	5k Breach	341,000	362,000	383,000	398,000	412,000
	10k Breach	341,000	359,287	388,000	403,000	417,000
	20k Breach	341,000	367,000	388,000	403,000	417,000
	30k Breach	341,000	367,000	388,000	403,000	417,000
500-yr + 3' Raise	5k Breach	341,000	367,000	383,000	398,000	412,000
	10k Breach	341,000	367,000	378,000	398,765	417,000
	20k Breach	341,000	367,000	385,961	403,000	417,000
	30k Breach	341,000	367,000	388,000	403,000	417,000
500-yr + 5' Raise	5k Breach	341,000	367,000	388,000	398,000	412,000
	10k Breach	341,000	367,000	388,000	393,000	407,000
	20k Breach	341,000	367,000	388,000	394,530	417,000
	30k Breach	341,000	367,000	388,000	400,883	417,000

The maximum possible increase in peak flow due to the various alternatives was chosen and is tabulated below:

Table 3. Increase in Flows Seen Downstream of Argentine

Alternative	$\Delta$ Peak Flows Seen D/S of Argentine (cfs)				
	500-yr	750-yr	1000-yr	1250-yr	1500-yr
500-yr Raise	5,375	0	0	0	0
500-yr + 3' Raise	5,375	5,000	0	0	0
500-yr + 5' Raise	5,375	5,000	5,000	0	0

- f) These increases in flow are actually from the possibility of the existing conditions to reduce the peak flow as compared to the full peak being able to be conveyed downstream in the proposed raise alternatives. Therefore, in actuality the existing conditions flows could be less than the UMRSFFS peak flow for a given frequency event. However, the procedure outlined in this MFR is approximate and does not justify modifying existing conditions flows. To represent this possible increase in peak flows as induced damages, the Kansas River flows were modified in HEC-RAS to be the UMRSFFS peak flow for a given frequency event plus the delta Q between the raised alternative and existing conditions. The following is an example of the 0.2% chance (500-yr) flow used in the analysis of induced damages for the 500+0 raise alternative:

$$\begin{aligned}Q_{500\text{induced}} &= Q_{500} + \Delta Q_{500} \\346,375 \text{ cfs} &= 341,000 \text{ cfs} + 5,375 \text{ cfs}\end{aligned}$$

Table 4. Kansas River Induced Flows

Alternative	Induced Peak Flows Seen D/S of Argentine (cfs)				
	500-yr	750-yr	1000-yr	1250-yr	1500-yr
500-yr Raise	346,375	---	---	---	---
500-yr + 3' Raise	346,375	372,000	---	---	---
500-yr + 5' Raise	346,375	372,000	393,000	---	---

- g) The increased flows were run in HEC-RAS to generate an estimated water surface showing maximum induced damages due to the proposed levee raises. This estimated water surface is compared to the future conditions without project water surface profiles to determine the magnitude of induced increases in the water surface for the Kansas River. The induced damages due the 0.2% chance (500-yr) event are identical for each proposed alternative. The induced damages due the 0.133% chance (750-yr) event occur for only the 500+3 and 500+5 alternatives and are identical for both. The induced damages due the 0.1% chance (1000-yr) event occur for only the 500+5 alternative.
- h) The likely overtopping point as seen on Plate 1 is near River Mile 4.48. Therefore, the induced peak flows are applicable to Kansas River Miles 4.48 and below. However, backwater effects due to this increased downstream flow cause

an increase in the water surface upstream of the breach location. Therefore, the induced water surface increase caused by the downstream analysis must be compared to that caused by the upstream and opposite of Argentine analysis, with the larger increase in water surface controlling for the HEC-FDA Induced Damages Analysis.

#### 4.2 Areas upstream and opposite of the Argentine Unit

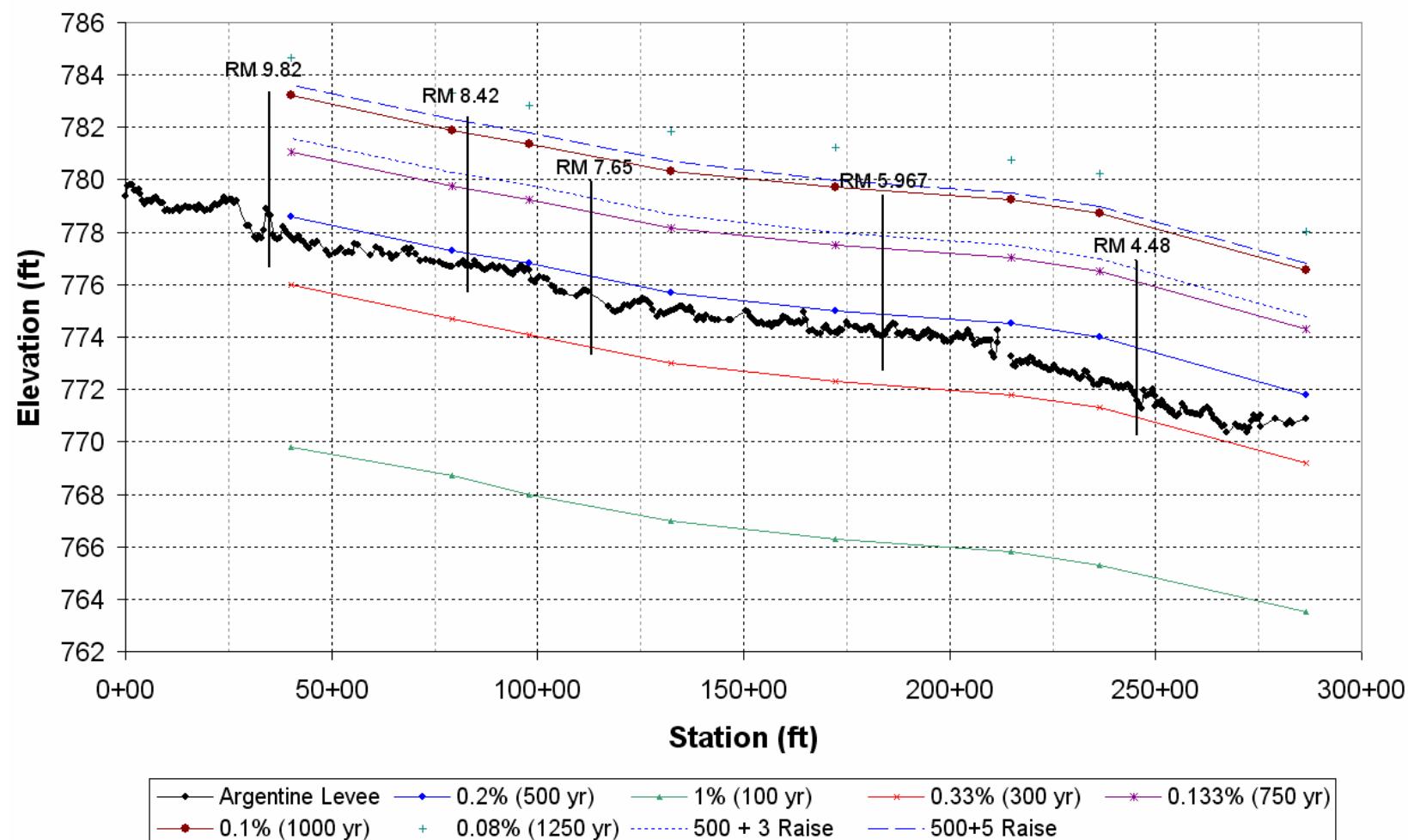
- a) The future conditions without project were evaluated with flow behind the levee in the protected area. The protected area was set with a permanent ineffective flow area extending from the levee to the bluff line at an elevation two feet below the existing top of levee. This modification allowed the top two feet and above of protected area to convey flow in the event of overtopping. This ineffective flow area definition modeled the obstructions at the lower levels and the presence of the downstream end of the unit preventing conveyance of the full depth of the protected area.
- b) The future conditions with project profiles allowing flow behind the levee were then modeled in the same manner, with the ineffective flow elevation being two feet below the proposed top of levee.
- c) The deltas between the future conditions with project and without project water surface with protected area conveyance were then calculated to determine the impacts of the proposed projects on the water surface profiles.
- d) The delta in water surface was then added to the design water surface profiles for the future conditions with project (confined profiles) to produce an induced damages profile for economic calculations.
- e) The upstream and opposite induced damage water surface increases must be compared to the increases in water surface caused by the additional flow in the downstream analysis to determine which delta controls for the Kansas River above River Mile 4.48.

5. Results. The attached tables are a summation of the flood profiles generated in this HEC-RAS analysis and manipulated in an EXCEL spreadsheet. Table 5 displays the results of the HEC-RAS induced damages water surface increases in flood peaks for the n500+0 project alternative due to the downstream analysis described in Paragraph 4.1. Table 6 displays the results of the HEC-RAS induced damages water surface increases in flood peaks for the n500+3 project alternative due to the downstream analysis described in Paragraph 4.1. Table 7 displays the results of the HEC-RAS induced damages water surface increases in flood peaks for the n500+5 project alternative due to the downstream analysis described in Paragraph 4.1. The maximum downstream induced impact to the water surface profile is 0.50 ft seen near the downstream end of the Argentine Levee Unit. Table 8 displays the results of the HEC-RAS induced damages water surface increases for the n500+0 project alternative due to the upstream and opposite bank

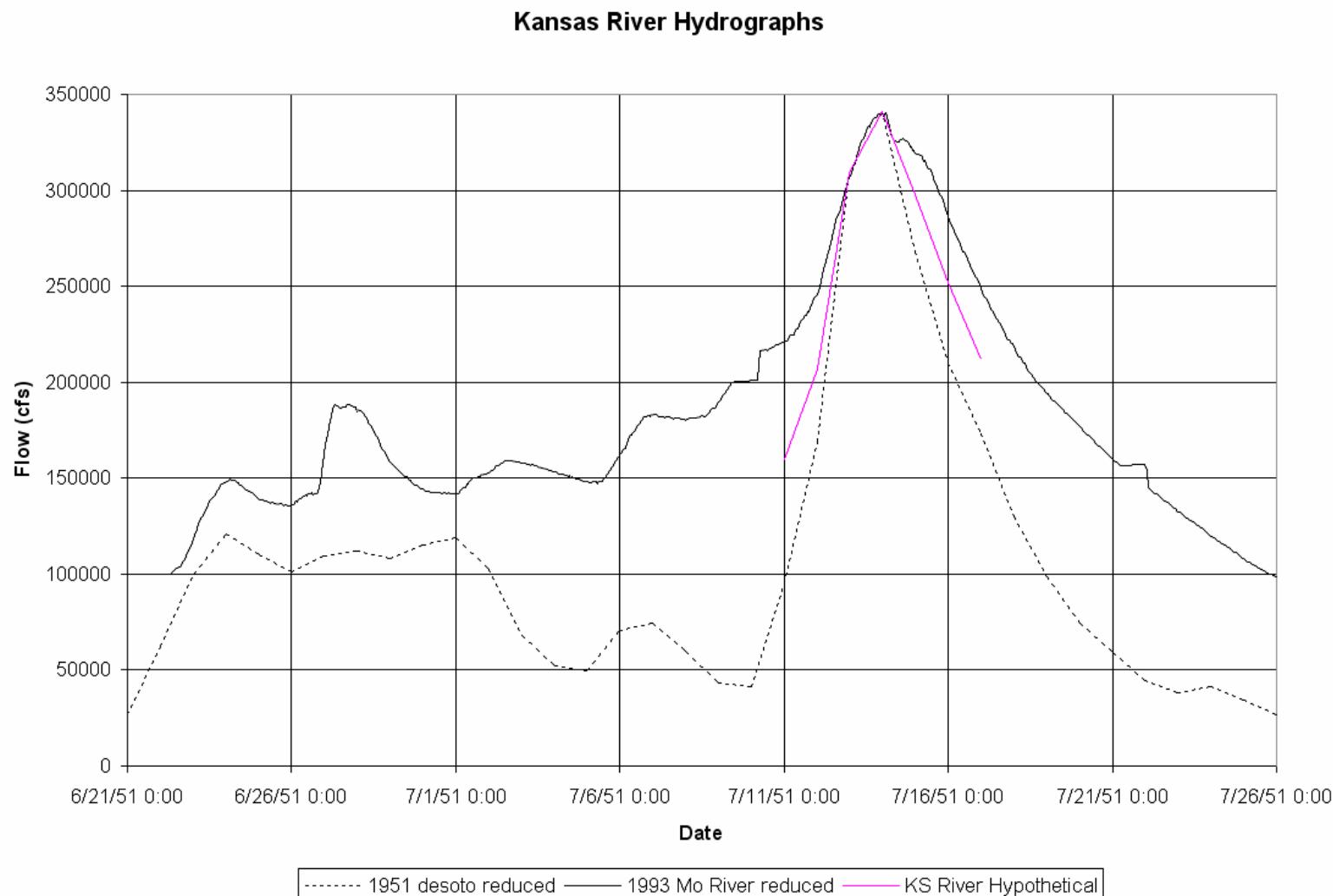
analysis described in Paragraph 4.2. Table 9 displays the results of the HEC-RAS induced damages water surface increases for the n500+3 project alternative due to the upstream and opposite bank analysis described in Paragraph 4.2. Table 10 displays the results of the HEC-RAS induced damages water surface increases for the n500+5 project alternative due to the upstream and opposite bank analysis described in Paragraph 4.2. It should be noted that in all proposed raises no impacts were seen to the 0.5% and more frequent floods as they did not overtop the existing levee.

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**Plate 1. Argentine Levee Unit Water Surface Profiles and Proposed Raises**  
 Argentine Unit Top of Levee

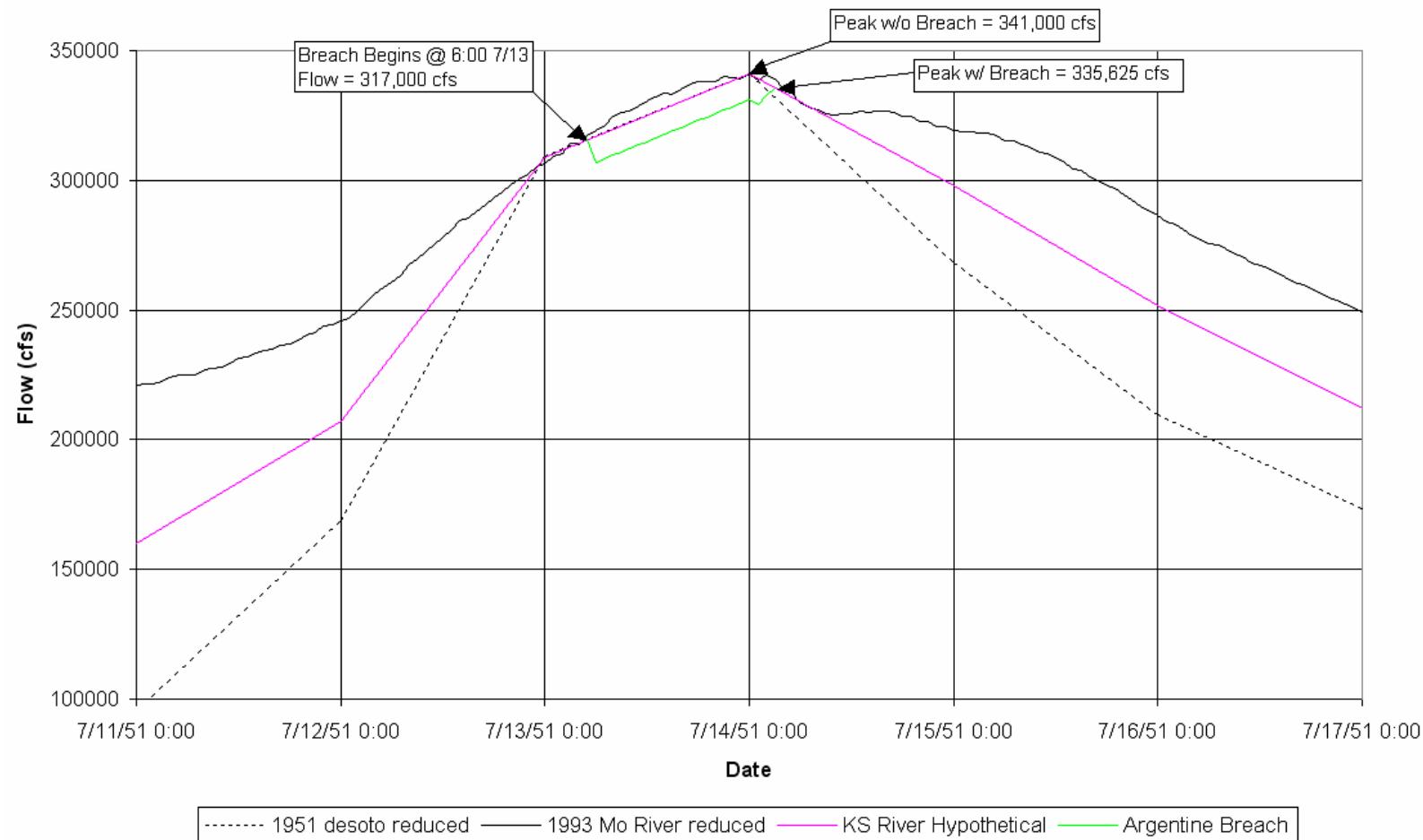


**Plate 2. Kansas River Hypothetical Hydrograph**



**Plate 3. Sample Kansas River Hydrograph w/ Breach**

**Kansas River Hydrograph  
Existing Conditions 0.2% Chance (500-yr) Event  
10,000 cfs Breach Flow**



**Table 5. Downstream Induced Damages Due to Argentine n500+0 Levee Raise**

River	Future Conditions Without Project			Estimated Future Conditions With Project			Δ Water Surface		
	500-yr	750-yr	1000-yr	500-yr	750-yr	1000-yr	500-yr	750-yr	1000-yr
	Mile	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
0.01	756.75	758.02	758.93	756.75	758.02	758.93	0.00	0.00	0.00
0.14	756.83	758.10	759.01	756.83	758.10	759.01	0.00	0.00	0.00
0.22	756.79	758.05	758.94	756.79	758.05	758.94	0.00	0.00	0.00
0.253	756.77	758.02	758.90	756.77	758.02	758.90	0.00	0.00	0.00
0.259	756.89	758.17	759.07	756.89	758.17	759.07	0.00	0.00	0.00
0.273704	757.62	759.02	760.01	757.62	759.02	760.01	0.00	0.00	0.00
0.285582	757.76	759.18	760.19	757.76	759.18	760.19	0.00	0.00	0.00
0.29746	757.77	759.19	760.21	757.77	759.19	760.21	0.00	0.00	0.00
0.309339	757.90	759.34	760.36	757.90	759.34	760.36	0.00	0.00	0.00
0.44	757.98	759.41	760.43	757.98	759.41	760.43	0.00	0.00	0.00
0.496	758.50	760.00	761.08	758.50	760.00	761.08	0.00	0.00	0.00
0.504	758.64	760.18	761.28	758.64	760.18	761.28	0.00	0.00	0.00
0.64	758.78	760.29	761.36	758.78	760.29	761.36	0.00	0.00	0.00
0.812	758.93	760.45	761.53	758.93	760.45	761.53	0.00	0.00	0.00
0.817	759.04	760.70	761.92	759.04	760.70	761.92	0.00	0.00	0.00
1.106	759.91	761.64	762.91	759.91	761.64	762.91	0.00	0.00	0.00
1.117	760.02	761.91	763.31	760.03	761.91	763.31	0.01	0.00	0.00
1.27	761.08	763.06	764.54	761.37	763.06	764.54	0.29	0.00	0.00
1.385	761.34	763.28	764.76	761.63	763.28	764.76	0.29	0.00	0.00
1.413	761.67	763.56	765.08	761.96	763.56	765.08	0.29	0.00	0.00
1.614	761.74	763.61	765.14	762.03	763.61	765.14	0.29	0.00	0.00
1.62401	762.23	764.21	765.93	762.55	764.21	765.93	0.32	0.00	0.00
1.6335	762.26	764.23	765.96	762.58	764.23	765.96	0.32	0.00	0.00
1.643	762.46	764.55	766.38	762.78	764.55	766.38	0.32	0.00	0.00
2.016	763.64	765.59	767.39	763.97	765.59	767.39	0.33	0.00	0.00
2.097	763.98	765.95	767.74	764.31	765.95	767.74	0.33	0.00	0.00
2.111	764.31	766.45	768.40	764.67	766.45	768.40	0.36	0.00	0.00
2.165	765.08	767.27	769.24	765.46	767.27	769.24	0.38	0.00	0.00
2.179	765.46	767.79	769.89	765.87	767.79	769.89	0.41	0.00	0.00

River	Future Conditions Without Project			Estimated Future Conditions With Project			Δ Water Surface		
	500-yr	750-yr	1000-yr	500-yr	750-yr	1000-yr	500-yr	750-yr	1000-yr
	Mile	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
2.491	766.05	768.33	770.38	766.45	768.33	770.38	0.40	0.00	0.00
2.525	766.10	768.38	770.43	766.50	768.38	770.43	0.40	0.00	0.00
2.536	766.64	769.16	771.38	767.12	769.16	771.38	0.48	0.00	0.00
3.05	768.54	771.03	773.21	769.02	771.03	773.21	0.48	0.00	0.00
3.405	769.43	771.92	774.09	769.91	771.92	774.09	0.48	0.00	0.00
3.427	769.75	772.31	774.54	770.25	772.31	774.54	0.50	0.00	0.00
3.96	770.71	773.23	775.41	771.20	773.23	775.41	0.49	0.00	0.00
4.276	771.23	773.72	775.89	771.71	773.72	775.89	0.48	0.00	0.00
4.284	771.42	773.97	776.21	771.92	773.97	776.21	0.50	0.00	0.00
4.48	771.78	774.32	776.54	772.27	774.32	776.54	0.49	0.00	0.00
4.949	773.18	775.73	777.92	773.68	775.73	777.92	0.5	0.00	0.00
4.97	773.41	776.00	778.24	773.91	776.00	778.24	0.5	0.00	0.00
5.506	773.93	776.51	778.73	774.41	776.51	778.73	0.48	0.00	0.00
5.52	773.97	776.55	778.77	774.45	776.55	778.77	0.48	0.00	0.00
5.811	774.47	777.06	779.28	774.94	777.06	779.28	0.47	0.00	0.00
5.831	774.49	777.10	779.33	774.97	777.10	779.33	0.48	0.00	0.00
6.88	774.97	777.55	779.77	775.43	777.55	779.77	0.46	0.00	0.00
7.329	775.21	777.78	779.98	775.66	777.78	779.98	0.45	0.00	0.00
7.333	775.22	777.79	780.00	775.67	777.79	780.00	0.45	0.00	0.00
7.342	775.24	777.81	780.01	775.7	777.81	780.01	0.46	0.00	0.00
7.351	775.27	777.82	780.03	775.71	777.82	780.03	0.44	0.00	0.00
7.36	775.29	777.85	780.06	775.74	777.85	780.06	0.45	0.00	0.00
7.364	775.31	777.86	780.07	775.75	777.86	780.07	0.44	0.00	0.00
7.65	775.65	778.20	780.38	776.08	778.20	780.38	0.43	0.00	0.00
8.42	776.75	779.26	781.42	777.14	779.26	781.42	0.39	0.00	0.00
9.04	777.31	779.79	781.91	777.69	779.79	781.91	0.38	0.00	0.00
9.49	778.00	780.43	782.51	778.35	780.43	782.51	0.35	0.00	0.00
9.505	778.02	780.51	782.63	778.39	780.51	782.63	0.37	0.00	0.00
9.82	778.59	781.07	783.21	778.94	781.07	783.21	0.35	0.00	0.00
10.4	778.80	781.27	783.39	779.14	781.27	783.39	0.34	0.00	0.00
10.6	779.00	781.46	783.57	779.34	781.46	783.57	0.34	0.00	0.00
10.9	779.85	782.25	784.30	780.16	782.25	784.30	0.31	0.00	0.00

River	Future Conditions Without Project			Estimated Future Conditions With Project			Δ Water Surface		
	500-yr	750-yr	1000-yr	500-yr	750-yr	1000-yr	500-yr	750-yr	1000-yr
	Mile	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
11.35	780.29	782.67	784.70	780.6	782.67	784.70	0.31	0.00	0.00
11.85	780.85	783.19	785.19	781.14	783.19	785.19	0.29	0.00	0.00
12.4	781.22	783.52	785.45	781.5	783.52	785.45	0.28	0.00	0.00
12.94	781.44	783.70	785.68	781.71	783.70	785.68	0.27	0.00	0.00
13.3	781.68	784.02	785.97	781.95	784.02	785.97	0.27	0.00	0.00
13.65	781.96	784.26	786.18	782.22	784.26	786.18	0.26	0.00	0.00
14.25	782.15	784.43	786.35	782.4	784.43	786.35	0.25	0.00	0.00
14.62	782.30	784.58	786.48	782.55	784.58	786.48	0.25	0.00	0.00

**Shaded Cells are Induced Water Surface Increases that Controlled for HEC-FDA Analysis**

**Table 6. Downstream Induced Damages Due to Argentine n500+3 Levee Raise**

River	Future Conditions Without Project			Estimated Future Conditions With Project			Δ Water Surface		
	500-yr	750-yr	1000-yr	500-yr	750-yr	1000-yr	500-yr	750-yr	1000-yr
	Mile	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
0.01	756.75	758.02	758.93	756.75	758.21	758.93	0.00	0.19	0.00
0.14	756.83	758.10	759.01	756.83	758.28	759.01	0.00	0.18	0.00
0.22	756.79	758.05	758.94	756.79	758.23	758.94	0.00	0.18	0.00
0.253	756.77	758.02	758.90	756.77	758.19	758.90	0.00	0.17	0.00
0.259	756.89	758.17	759.07	756.89	758.35	759.07	0.00	0.18	0.00
0.273704	757.62	759.02	760.01	757.62	759.21	760.01	0.00	0.19	0.00
0.285582	757.76	759.18	760.19	757.76	759.38	760.19	0.00	0.20	0.00
0.29746	757.77	759.19	760.21	757.77	759.40	760.21	0.00	0.21	0.00
0.309339	757.90	759.34	760.36	757.90	759.54	760.36	0.00	0.20	0.00
0.44	757.98	759.41	760.43	757.98	759.61	760.43	0.00	0.20	0.00
0.496	758.50	760.00	761.08	758.50	760.22	761.08	0.00	0.22	0.00
0.504	758.64	760.18	761.28	758.64	760.40	761.28	0.00	0.22	0.00
0.64	758.78	760.29	761.36	758.78	760.51	761.36	0.00	0.22	0.00
0.812	758.93	760.45	761.53	758.93	760.67	761.53	0.00	0.22	0.00
0.817	759.04	760.70	761.92	759.04	760.94	761.92	0.00	0.24	0.00
1.106	759.91	761.64	762.91	759.91	761.89	762.91	0.00	0.25	0.00
1.117	760.02	761.91	763.31	760.03	762.19	763.31	0.01	0.28	0.00
1.27	761.08	763.06	764.54	761.37	763.35	764.54	0.29	0.29	0.00
1.385	761.34	763.28	764.76	761.63	763.56	764.76	0.29	0.28	0.00
1.413	761.67	763.56	765.08	761.96	763.85	765.08	0.29	0.29	0.00
1.614	761.74	763.61	765.14	762.03	763.91	765.14	0.29	0.30	0.00
1.62401	762.23	764.21	765.93	762.55	764.53	765.93	0.32	0.32	0.00
1.6335	762.26	764.23	765.96	762.58	764.56	765.96	0.32	0.33	0.00
1.643	762.46	764.55	766.38	762.78	764.90	766.38	0.32	0.35	0.00
2.016	763.64	765.59	767.39	763.97	765.94	767.39	0.33	0.35	0.00
2.097	763.98	765.95	767.74	764.31	766.29	767.74	0.33	0.34	0.00
2.111	764.31	766.45	768.40	764.67	766.83	768.40	0.36	0.38	0.00
2.165	765.08	767.27	769.24	765.46	767.66	769.24	0.38	0.39	0.00
2.179	765.46	767.79	769.89	765.87	768.21	769.89	0.41	0.42	0.00

River	Future Conditions Without Project			Estimated Future Conditions With Project			Δ Water Surface		
	500-yr	750-yr	1000-yr	500-yr	750-yr	1000-yr	500-yr	750-yr	1000-yr
	Mile	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
2.491	766.05	768.33	770.38	766.45	768.74	770.38	0.40	0.41	0.00
2.525	766.10	768.38	770.43	766.50	768.79	770.43	0.40	0.41	0.00
2.536	766.64	769.16	771.38	767.12	769.60	771.38	0.48	0.44	0.00
3.05	768.54	771.03	773.21	769.02	771.47	773.21	0.48	0.44	0.00
3.405	769.43	771.92	774.09	769.91	772.36	774.09	0.48	0.44	0.00
3.427	769.75	772.31	774.54	770.25	772.77	774.54	0.50	0.46	0.00
3.96	770.71	773.23	775.41	771.20	773.68	775.41	0.49	0.45	0.00
4.276	771.23	773.72	775.89	771.71	774.17	775.89	0.48	0.45	0.00
4.284	771.42	773.97	776.21	771.92	774.44	776.21	0.50	0.47	0.00
4.48	771.78	774.32	776.54	772.27	774.78	776.54	0.49	0.46	0.00
4.949	773.18	775.73	777.92	773.68	776.17	777.92	0.5	0.44	0.00
4.97	773.41	776.00	778.24	773.91	776.45	778.24	0.5	0.45	0.00
5.506	773.93	776.51	778.73	774.41	776.94	778.73	0.48	0.43	0.00
5.52	773.97	776.55	778.77	774.45	776.99	778.77	0.48	0.44	0.00
5.811	774.47	777.06	779.28	774.94	777.49	779.28	0.47	0.43	0.00
5.831	774.49	777.10	779.33	774.97	777.53	779.33	0.48	0.43	0.00
6.88	774.97	777.55	779.77	775.43	777.97	779.77	0.46	0.42	0.00
7.329	775.21	777.78	779.98	775.66	778.18	779.98	0.45	0.4	0.00
7.333	775.22	777.79	780.00	775.67	778.19	780.00	0.45	0.4	0.00
7.342	775.24	777.81	780.01	775.7	778.22	780.01	0.46	0.41	0.00
7.351	775.27	777.82	780.03	775.71	778.23	780.03	0.44	0.41	0.00
7.36	775.29	777.85	780.06	775.74	778.25	780.06	0.45	0.4	0.00
7.364	775.31	777.86	780.07	775.75	778.26	780.07	0.44	0.4	0.00
7.65	775.65	778.20	780.38	776.08	778.58	780.38	0.43	0.38	0.00
8.42	776.75	779.26	781.42	777.14	779.62	781.42	0.39	0.36	0.00
9.04	777.31	779.79	781.91	777.69	780.13	781.91	0.38	0.34	0.00
9.49	778.00	780.43	782.51	778.35	780.76	782.51	0.35	0.33	0.00
9.505	778.02	780.51	782.63	778.39	780.84	782.63	0.37	0.33	0.00
9.82	778.59	781.07	783.21	778.94	781.42	783.21	0.35	0.35	0.00
10.4	778.80	781.27	783.39	779.14	781.61	783.39	0.34	0.34	0.00
10.6	779.00	781.46	783.57	779.34	781.8	783.57	0.34	0.34	0.00
10.9	779.85	782.25	784.30	780.16	782.56	784.30	0.31	0.31	0.00

River	Future Conditions Without Project			Estimated Future Conditions With Project			Δ Water Surface		
	500-yr	750-yr	1000-yr	500-yr	750-yr	1000-yr	500-yr	750-yr	1000-yr
	Mile	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
11.35	780.29	782.67	784.70	780.6	782.97	784.70	0.31	0.3	0.00
11.85	780.85	783.19	785.19	781.14	783.48	785.19	0.29	0.29	0.00
12.4	781.22	783.52	785.45	781.5	783.8	785.45	0.28	0.28	0.00
12.94	781.44	783.70	785.68	781.71	783.98	785.68	0.27	0.28	0.00
13.3	781.68	784.02	785.97	781.95	784.28	785.97	0.27	0.26	0.00
13.65	781.96	784.26	786.18	782.22	784.52	786.18	0.26	0.26	0.00
14.25	782.15	784.43	786.35	782.4	784.69	786.35	0.25	0.26	0.00
14.62	782.30	784.58	786.48	782.55	784.83	786.48	0.25	0.25	0.00

**Shaded Cells are Induced Water Surface Increases that Controlled for HEC-FDA Analysis**

**Table 7. Downstream Induced Damages Due to Argentine n500+5 Levee Raise**

River	Future Conditions Without Project			Estimated Future Conditions With Project			Δ Water Surface		
	500-yr	750-yr	1000-yr	500-yr	750-yr	1000-yr	500-yr	750-yr	1000-yr
	Mile	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
0.01	756.75	758.02	758.93	756.75	758.21	759.13	0.00	0.19	0.20
0.14	756.83	758.10	759.01	756.83	758.28	759.20	0.00	0.18	0.19
0.22	756.79	758.05	758.94	756.79	758.23	759.14	0.00	0.18	0.20
0.253	756.77	758.02	758.90	756.77	758.19	759.09	0.00	0.17	0.19
0.259	756.89	758.17	759.07	756.89	758.35	759.27	0.00	0.18	0.20
0.273704	757.62	759.02	760.01	757.62	759.21	760.22	0.00	0.19	0.21
0.285582	757.76	759.18	760.19	757.76	759.38	760.40	0.00	0.20	0.21
0.29746	757.77	759.19	760.21	757.77	759.40	760.42	0.00	0.21	0.21
0.309339	757.90	759.34	760.36	757.90	759.54	760.58	0.00	0.20	0.22
0.44	757.98	759.41	760.43	757.98	759.61	760.64	0.00	0.20	0.21
0.496	758.50	760.00	761.08	758.50	760.22	761.30	0.00	0.22	0.22
0.504	758.64	760.18	761.28	758.64	760.40	761.50	0.00	0.22	0.22
0.64	758.78	760.29	761.36	758.78	760.51	761.58	0.00	0.22	0.22
0.812	758.93	760.45	761.53	758.93	760.67	761.76	0.00	0.22	0.23
0.817	759.04	760.70	761.92	759.04	760.94	762.17	0.00	0.24	0.25
1.106	759.91	761.64	762.91	759.91	761.89	763.17	0.00	0.25	0.26
1.117	760.02	761.91	763.31	760.03	762.19	763.60	0.01	0.28	0.29
1.27	761.08	763.06	764.54	761.37	763.35	764.84	0.29	0.29	0.30
1.385	761.34	763.28	764.76	761.63	763.56	765.06	0.29	0.28	0.30
1.413	761.67	763.56	765.08	761.96	763.85	765.39	0.29	0.29	0.31
1.614	761.74	763.61	765.14	762.03	763.91	765.45	0.29	0.30	0.31
1.62401	762.23	764.21	765.93	762.55	764.53	766.29	0.32	0.32	0.36
1.6335	762.26	764.23	765.96	762.58	764.56	766.31	0.32	0.33	0.35
1.643	762.46	764.55	766.38	762.78	764.90	766.74	0.32	0.35	0.36
2.016	763.64	765.59	767.39	763.97	765.94	767.75	0.33	0.35	0.36
2.097	763.98	765.95	767.74	764.31	766.29	768.10	0.33	0.34	0.36
2.111	764.31	766.45	768.40	764.67	766.83	768.76	0.36	0.38	0.36
2.165	765.08	767.27	769.24	765.46	767.66	769.61	0.38	0.39	0.37
2.179	765.46	767.79	769.89	765.87	768.21	770.29	0.41	0.42	0.40

River	Future Conditions Without Project			Estimated Future Conditions With Project			Δ Water Surface		
	500-yr	750-yr	1000-yr	500-yr	750-yr	1000-yr	500-yr	750-yr	1000-yr
	Mile	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
2.491	766.05	768.33	770.38	766.45	768.74	770.78	0.40	0.41	0.40
2.525	766.10	768.38	770.43	766.50	768.79	770.82	0.40	0.41	0.39
2.536	766.64	769.16	771.38	767.12	769.60	771.81	0.48	0.44	0.43
3.05	768.54	771.03	773.21	769.02	771.47	773.64	0.48	0.44	0.43
3.405	769.43	771.92	774.09	769.91	772.36	774.52	0.48	0.44	0.43
3.427	769.75	772.31	774.54	770.25	772.77	774.99	0.50	0.46	0.45
3.96	770.71	773.23	775.41	771.20	773.68	775.85	0.49	0.45	0.44
4.276	771.23	773.72	775.89	771.71	774.17	776.33	0.48	0.45	0.44
4.284	771.42	773.97	776.21	771.92	774.44	776.67	0.50	0.47	0.46
4.48	771.78	774.32	776.54	772.27	774.78	777.00	0.49	0.46	0.46
4.949	773.18	775.73	777.92	773.68	776.17	778.36	0.5	0.44	0.44
4.97	773.41	776.00	778.24	773.91	776.45	778.68	0.5	0.45	0.44
5.506	773.93	776.51	778.73	774.41	776.94	779.15	0.48	0.43	0.42
5.52	773.97	776.55	778.77	774.45	776.99	779.2	0.48	0.44	0.43
5.811	774.47	777.06	779.28	774.94	777.49	779.7	0.47	0.43	0.42
5.831	774.49	777.10	779.33	774.97	777.53	779.75	0.48	0.43	0.42
6.88	774.97	777.55	779.77	775.43	777.97	780.17	0.46	0.42	0.4
7.329	775.21	777.78	779.98	775.66	778.18	780.38	0.45	0.4	0.4
7.333	775.22	777.79	780.00	775.67	778.19	780.38	0.45	0.4	0.38
7.342	775.24	777.81	780.01	775.7	778.22	780.41	0.46	0.41	0.4
7.351	775.27	777.82	780.03	775.71	778.23	780.42	0.44	0.41	0.39
7.36	775.29	777.85	780.06	775.74	778.25	780.45	0.45	0.4	0.39
7.364	775.31	777.86	780.07	775.75	778.26	780.46	0.44	0.4	0.39
7.65	775.65	778.20	780.38	776.08	778.58	780.76	0.43	0.38	0.38
8.42	776.75	779.26	781.42	777.14	779.62	781.77	0.39	0.36	0.35
9.04	777.31	779.79	781.91	777.69	780.13	782.25	0.38	0.34	0.34
9.49	778.00	780.43	782.51	778.35	780.76	782.83	0.35	0.33	0.32
9.505	778.02	780.51	782.63	778.39	780.84	782.96	0.37	0.33	0.33
9.82	778.59	781.07	783.21	778.94	781.42	783.56	0.35	0.35	0.35
10.4	778.80	781.27	783.39	779.14	781.61	783.73	0.34	0.34	0.34
10.6	779.00	781.46	783.57	779.34	781.8	783.91	0.34	0.34	0.34
10.9	779.85	782.25	784.30	780.16	782.56	784.62	0.31	0.31	0.32

River	Future Conditions Without Project			Estimated Future Conditions With Project			Δ Water Surface		
	500-yr	750-yr	1000-yr	500-yr	750-yr	1000-yr	500-yr	750-yr	1000-yr
	Mile	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
11.35	780.29	782.67	784.70	780.6	782.97	785.01	0.31	0.3	0.31
11.85	780.85	783.19	785.19	781.14	783.48	785.49	0.29	0.29	0.3
12.4	781.22	783.52	785.45	781.5	783.8	785.73	0.28	0.28	0.28
12.94	781.44	783.70	785.68	781.71	783.98	785.96	0.27	0.28	0.28
13.3	781.68	784.02	785.97	781.95	784.28	786.24	0.27	0.26	0.27
13.65	781.96	784.26	786.18	782.22	784.52	786.45	0.26	0.26	0.27
14.25	782.15	784.43	786.35	782.4	784.69	786.61	0.25	0.26	0.26
14.62	782.30	784.58	786.48	782.55	784.83	786.74	0.25	0.25	0.26

**Shaded Cells are Induced Water Surface Increases that Controlled for HEC-FDA Analysis**

**Table 8. Upstream and Opposite Bank Induced Damages Due to Argentine n500+0 Raise**

River Mile	Future Conditions Without Project				Estimated Future Conditions With Project				Δ Water Surface						
	500-yr	750-yr	1000-yr	1250-yr	1500-yr	500-yr	750-yr	1000-yr	1250-yr	1500-yr	500-yr	750-yr	1000-yr	1250-yr	1500-yr
4.949	773.18	775.73	777.92	779.38	780.68	773.18	775.73	777.92	779.38	780.68	0.00	0.00	0.00	0.00	0.00
4.97	773.41	776.00	778.24	779.74	781.07	773.41	776.00	778.25	779.75	781.08	0.00	0.00	0.01	0.01	0.01
5.506	773.93	776.51	778.73	780.22	781.54	773.93	776.51	778.73	780.22	781.54	0.00	0.00	0.00	0.00	0.00
5.52	773.97	776.55	778.77	780.27	781.59	773.97	776.55	778.77	780.27	781.59	0.00	0.00	0.00	0.00	0.00
5.811	774.47	777.06	779.28	780.78	782.11	774.49	777.09	779.32	780.85	782.19	0.02	0.03	0.04	0.07	0.08
5.831	774.49	777.10	779.33	780.84	782.18	774.53	777.14	779.41	780.95	782.29	0.04	0.04	0.08	0.11	0.11
6.88	774.97	777.55	779.77	781.26	782.59	775.01	777.62	779.86	781.37	782.73	0.04	0.07	0.09	0.11	0.14
7.329	775.21	777.78	779.98	781.46	782.80	775.25	777.84	780.09	781.58	782.94	0.04	0.06	0.11	0.12	0.14
7.333	775.22	777.79	780.00	781.47	782.81	775.28	777.87	780.10	781.60	782.96	0.06	0.08	0.10	0.13	0.15
7.342	775.24	777.81	780.01	781.50	782.83	775.26	777.82	780.04	781.53	782.86	0.02	0.01	0.03	0.03	0.03
7.351	775.27	777.82	780.03	781.51	782.84	775.27	777.84	780.04	781.52	782.86	0.00	0.02	0.01	0.01	0.02
7.36	775.29	777.85	780.06	781.54	782.87	775.29	777.85	780.06	781.54	782.87	0.00	0.00	0.00	0.00	0.00
7.364	775.31	777.86	780.07	781.55	782.88	775.31	777.86	780.07	781.55	782.88	0.00	0.00	0.00	0.00	0.00
7.65	775.65	778.20	780.38	781.85	783.17	775.65	778.20	780.38	781.85	783.17	0.00	0.00	0.00	0.00	0.00
8.42	776.75	779.26	781.42	782.87	784.18	776.83	779.39	781.61	783.10	784.47	0.08	0.13	0.19	0.23	0.29
9.04	777.31	779.79	781.91	783.34	784.63	777.39	779.94	782.15	783.63	784.98	0.08	0.15	0.24	0.29	0.35
9.49	778.00	780.43	782.51	783.92	785.19	778.14	780.65	782.84	784.33	785.66	0.14	0.22	0.33	0.41	0.47
9.505	778.02	780.51	782.63	784.07	785.36	778.16	780.71	782.95	784.44	785.80	0.14	0.20	0.32	0.37	0.44
9.82	778.59	781.07	783.21	784.67	786.00	778.75	781.31	783.57	785.10	786.49	0.16	0.24	0.36	0.43	0.49
10.4	778.80	781.27	783.39	784.84	786.17	778.96	781.53	783.77	785.29	786.71	0.16	0.26	0.38	0.45	0.54
10.6	779.00	781.46	783.57	785.02	786.34	779.16	781.70	783.94	785.47	786.86	0.16	0.24	0.37	0.45	0.52
10.9	779.85	782.25	784.30	785.71	787.01	779.99	782.48	784.64	786.13	787.51	0.14	0.23	0.34	0.42	0.50
11.35	780.29	782.67	784.70	786.10	787.38	780.43	782.89	785.05	786.52	787.88	0.14	0.22	0.35	0.42	0.50
11.85	780.85	783.19	785.19	786.57	787.84	780.99	783.40	785.51	786.97	788.31	0.14	0.21	0.32	0.40	0.47
12.4	781.22	783.52	785.45	786.81	788.07	781.36	783.73	785.77	787.20	788.53	0.14	0.21	0.32	0.39	0.46
12.94	781.44	783.70	785.68	787.03	788.28	781.58	783.91	785.99	787.40	788.72	0.14	0.21	0.31	0.37	0.44
13.3	781.68	784.02	785.97	787.31	788.54	781.80	784.21	786.27	787.69	788.98	0.12	0.19	0.30	0.38	0.44
13.65	781.96	784.26	786.18	787.51	788.73	782.06	784.46	786.47	787.87	789.17	0.10	0.20	0.29	0.36	0.44
14.25	782.15	784.43	786.35	787.66	788.88	782.27	784.61	786.65	788.01	789.30	0.12	0.18	0.30	0.35	0.42
14.62	782.30	784.58	786.48	787.79	789.00	782.42	784.78	786.77	788.14	789.41	0.12	0.20	0.29	0.35	0.41

**Shaded Cells are Induced Water Surface Increases that Controlled for HEC-FDA Analysis**

**Table 9. Upstream and Opposite Bank Induced Damages Due to Argentine n500+3 Raise**

River Mile	Future Conditions Without Project				Estimated Future Conditions With Project				Δ Water Surface						
	500-yr	750-yr	1000-yr	1250-yr	1500-yr	500-yr	750-yr	1000-yr	1250-yr	1500-yr	500-yr	750-yr	1000-yr	1250-yr	1500-yr
4.949	773.18	775.73	777.92	779.38	780.68	773.18	775.73	777.92	779.38	780.68	0.00	0.00	0.00	0.00	0.00
4.97	773.41	776.00	778.24	779.74	781.07	773.41	776.00	778.26	779.75	781.08	0.00	0.00	0.02	0.01	0.01
5.506	773.93	776.51	778.73	780.22	781.54	773.93	776.51	778.73	780.22	781.54	0.00	0.00	0.00	0.00	0.00
5.52	773.97	776.55	778.77	780.27	781.59	773.97	776.55	778.77	780.27	781.59	0.00	0.00	0.00	0.00	0.00
5.811	774.47	777.06	779.28	780.78	782.11	774.49	777.10	779.34	780.86	782.21	0.02	0.04	0.06	0.08	0.10
5.831	774.49	777.10	779.33	780.84	782.18	774.53	777.16	779.43	780.97	782.32	0.04	0.06	0.10	0.13	0.14
6.88	774.97	777.55	779.77	781.26	782.59	775.01	777.65	779.89	781.41	782.76	0.04	0.10	0.12	0.15	0.17
7.329	775.21	777.78	779.98	781.46	782.80	775.25	777.86	780.11	781.61	782.98	0.04	0.08	0.13	0.15	0.18
7.333	775.22	777.79	780.00	781.47	782.81	775.28	777.89	780.13	781.63	783.00	0.06	0.10	0.13	0.16	0.19
7.342	775.24	777.81	780.01	781.50	782.83	775.26	777.81	780.02	781.52	782.86	0.02	0.00	0.01	0.02	0.03
7.351	775.27	777.82	780.03	781.51	782.84	775.27	777.82	780.03	781.51	782.87	0.00	0.00	0.00	0.00	0.03
7.36	775.29	777.85	780.06	781.54	782.87	775.29	777.85	780.06	781.54	782.87	0.00	0.00	0.00	0.00	0.00
7.364	775.31	777.86	780.07	781.55	782.88	775.31	777.86	780.07	781.55	782.88	0.00	0.00	0.00	0.00	0.00
7.65	775.65	778.20	780.38	781.85	783.17	775.65	778.20	780.38	781.85	783.17	0.00	0.00	0.00	0.00	0.00
8.42	776.75	779.26	781.42	782.87	784.18	776.83	779.44	781.69	783.18	784.56	0.08	0.18	0.27	0.31	0.38
9.04	777.31	779.79	781.91	783.34	784.63	777.39	780.03	782.25	783.75	785.10	0.08	0.24	0.34	0.41	0.47
9.49	778.00	780.43	782.51	783.92	785.19	778.14	780.80	782.99	784.48	785.82	0.14	0.37	0.48	0.56	0.63
9.505	778.02	780.51	782.63	784.07	785.36	778.16	780.86	783.10	784.59	785.95	0.14	0.35	0.47	0.52	0.59
9.82	778.59	781.07	783.21	784.67	786.00	778.75	781.46	783.73	785.27	786.66	0.16	0.39	0.52	0.60	0.66
10.4	778.80	781.27	783.39	784.84	786.17	778.96	781.69	783.94	785.47	786.89	0.16	0.42	0.55	0.63	0.72
10.6	779.00	781.46	783.57	785.02	786.34	779.16	781.87	784.11	785.65	787.05	0.16	0.41	0.54	0.63	0.71
10.9	779.85	782.25	784.30	785.71	787.01	779.99	782.63	784.80	786.29	787.68	0.14	0.38	0.50	0.58	0.67
11.35	780.29	782.67	784.70	786.10	787.38	780.43	783.03	785.20	786.68	788.04	0.14	0.36	0.50	0.58	0.66
11.85	780.85	783.19	785.19	786.57	787.84	780.99	783.53	785.66	787.12	788.47	0.14	0.34	0.47	0.55	0.63
12.4	781.22	783.52	785.45	786.81	788.07	781.36	783.86	785.92	787.35	788.68	0.14	0.34	0.47	0.54	0.61
12.94	781.44	783.70	785.68	787.03	788.28	781.58	784.04	786.13	787.55	788.88	0.14	0.34	0.45	0.52	0.60
13.3	781.68	784.02	785.97	787.31	788.54	781.80	784.34	786.40	787.83	789.13	0.12	0.32	0.43	0.52	0.59
13.65	781.96	784.26	786.18	787.51	788.73	782.06	784.58	786.60	788.01	789.32	0.10	0.32	0.42	0.50	0.59
14.25	782.15	784.43	786.35	787.66	788.88	782.27	784.73	786.79	788.15	789.45	0.12	0.30	0.44	0.49	0.57
14.62	782.30	784.58	786.48	787.79	789.00	782.42	784.90	786.90	788.28	789.56	0.12	0.32	0.42	0.49	0.56

**Shaded Cells are Induced Water Surface Increases that Controlled for HEC-FDA Analysis**

**Table 10. Upstream and Opposite Bank Induced Damages Due to Argentine n500+5 Raise**

River Mile	Future Conditions Without Project				Estimated Future Conditions With Project				Δ Water Surface						
	500-yr	750-yr	1000-yr	1250-yr	1500-yr	500-yr	750-yr	1000-yr	1250-yr	1500-yr	500-yr	750-yr	1000-yr	1250-yr	1500-yr
4.949	773.18	775.73	777.92	779.38	780.68	773.18	775.73	777.92	779.38	780.68	0.00	0.00	0.00	0.00	0.00
4.97	773.41	776.00	778.24	779.74	781.07	773.41	776.00	778.26	779.75	781.09	0.00	0.00	0.02	0.01	0.02
5.506	773.93	776.51	778.73	780.22	781.54	773.93	776.51	778.73	780.22	781.54	0.00	0.00	0.00	0.00	0.00
5.52	773.97	776.55	778.77	780.27	781.59	773.97	776.55	778.77	780.27	781.59	0.00	0.00	0.00	0.00	0.00
5.811	774.47	777.06	779.28	780.78	782.11	774.49	777.10	779.34	780.87	782.22	0.02	0.04	0.06	0.09	0.11
5.831	774.49	777.10	779.33	780.84	782.18	774.53	777.16	779.45	780.99	782.34	0.04	0.06	0.12	0.15	0.16
6.88	774.97	777.55	779.77	781.26	782.59	775.01	777.65	779.91	781.42	782.79	0.04	0.10	0.14	0.16	0.20
7.329	775.21	777.78	779.98	781.46	782.80	775.25	777.86	780.12	781.63	783.00	0.04	0.08	0.14	0.17	0.20
7.333	775.22	777.79	780.00	781.47	782.81	775.28	777.89	780.14	781.64	783.01	0.06	0.10	0.14	0.17	0.20
7.342	775.24	777.81	780.01	781.50	782.83	775.26	777.81	780.01	781.51	782.85	0.02	0.00	0.00	0.01	0.02
7.351	775.27	777.82	780.03	781.51	782.84	775.27	777.82	780.03	781.51	782.86	0.00	0.00	0.00	0.00	0.02
7.36	775.29	777.85	780.06	781.54	782.87	775.29	777.85	780.06	781.54	782.87	0.00	0.00	0.00	0.00	0.00
7.364	775.31	777.86	780.07	781.55	782.88	775.31	777.86	780.07	781.55	782.88	0.00	0.00	0.00	0.00	0.00
7.65	775.65	778.20	780.38	781.85	783.17	775.65	778.20	780.38	781.85	783.17	0.00	0.00	0.00	0.00	0.00
8.42	776.75	779.26	781.42	782.87	784.18	776.83	779.44	781.72	783.23	784.61	0.08	0.18	0.30	0.36	0.43
9.04	777.31	779.79	781.91	783.34	784.63	777.39	780.03	782.31	783.80	785.16	0.08	0.24	0.40	0.46	0.53
9.49	778.00	780.43	782.51	783.92	785.19	778.14	780.80	783.09	784.57	785.91	0.14	0.37	0.58	0.65	0.72
9.505	778.02	780.51	782.63	784.07	785.36	778.16	780.86	783.19	784.67	786.03	0.14	0.35	0.56	0.60	0.67
9.82	778.59	781.07	783.21	784.67	786.00	778.75	781.46	783.83	785.36	786.76	0.16	0.39	0.62	0.69	0.76
10.4	778.80	781.27	783.39	784.84	786.17	778.96	781.69	784.05	785.57	787.00	0.16	0.42	0.66	0.73	0.83
10.6	779.00	781.46	783.57	785.02	786.34	779.16	781.86	784.22	785.75	787.15	0.16	0.40	0.65	0.73	0.81
10.9	779.85	782.25	784.30	785.71	787.01	779.99	782.63	784.90	786.38	787.78	0.14	0.38	0.60	0.67	0.77
11.35	780.29	782.67	784.70	786.10	787.38	780.43	783.03	785.30	786.77	788.14	0.14	0.36	0.60	0.67	0.76
11.85	780.85	783.19	785.19	786.57	787.84	780.99	783.53	785.76	787.21	788.56	0.14	0.34	0.57	0.64	0.72
12.4	781.22	783.52	785.45	786.81	788.07	781.36	783.86	786.01	787.43	788.78	0.14	0.34	0.56	0.62	0.71
12.94	781.44	783.70	785.68	787.03	788.28	781.58	784.04	786.22	787.63	788.97	0.14	0.34	0.54	0.60	0.69
13.3	781.68	784.02	785.97	787.31	788.54	781.80	784.34	786.49	787.91	789.21	0.12	0.32	0.52	0.60	0.67
13.65	781.96	784.26	786.18	787.51	788.73	782.06	784.58	786.68	788.09	789.40	0.10	0.32	0.50	0.58	0.67
14.25	782.15	784.43	786.35	787.66	788.88	782.27	784.73	786.87	788.23	789.53	0.12	0.30	0.52	0.57	0.65
14.62	782.30	784.58	786.48	787.79	789.00	782.42	784.90	786.98	788.36	789.64	0.12	0.32	0.50	0.57	0.64

**Shaded Cells are Induced Water Surface Increases that Controlled for HEC-FDA Analysis**